

treatments given when signs of weakening are discovered.

10. The investigation of this method by hospitals and clinics where large numbers of hernias are treated would aid greatly to give this treatment the same dignity and standing as operative procedure.

11. Records of all patients treated should be kept for years, to determine the permanency of the cure by injection. Only by so doing can the true value of this treatment be estimated in terms of the results obtained by the operative treatment of hernia. If the results, say in ten years, prove to be only as good as those in the surgical treatment, at least a great economic saving would have been accomplished, and many patients who now refuse operation, or who are not physically fit to be operated upon, would be saved the danger and discomfort of an untreated hernia.

516 Sutter Street.

INJECTION TREATMENT OF HERNIA: ITS PRESENT-DAY STATUS*

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AND

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DISCUSSION by Charles Eaton Phillips, M.D., Los Angeles; Francis M. Findlay, M.D., Santa Barbara; Leonard Dobson, M.D., San Francisco; E. Eric Larson, M.D., Los Angeles; Alanson Weeks, M.D., and G. D. Delprat, M.D., San Francisco; Donald C. Collins, M.D., Los Angeles; W. L. Weber, M.D., Los Angeles. (The discussion refers to this and two preceding papers on the Injection Treatment of Hernia.)

THIS method of treatment of hernia, the basis of which has been established today on experimental laboratory findings, is possible in patients of all ages. With the present extent of the knowledge of this subject, however, it is advisable to limit its use to adults. The prime requisite is that the patient has a completely reducible hernia which can be maintained in complete reduction at all times during the course of active treatment by a properly fitting truss.

Cases of direct and indirect inguinal, and recurrent inguinal herniae, are the most suitable for this method of treatment. Although umbilical, femoral, and incisional herniae have been successfully treated by this method, it is best at this time to limit the discussion of its use to the inguinal varieties.¹

Chronic bronchitis and cardiac disease are no contraindication to the injection treatment.

APPLICATION OF TRUSS

The first and most important consideration in the actual treatment of any given case is the application of a truss. The hernia must not only be reducible, but it must be one which can be held completely reduced at all times regardless of the activity of the patient. The selection of the truss is of the utmost importance, for herein often de-

pends the success or failure of the treatment. The prerequisites, described in the previous paper, in the construction of the truss must be remembered. Such a truss must be worn day and night during the course of injection, and for a four-week period thereafter. Depending on the physical activity of the patient, it must be further worn during the day for an additional four- to six-month period. It is, therefore, imperative that reasonable comfort be provided in the fitting of the truss. It must be made of waterproof material, as the patient keeps it on during his shower. When the patient is fitted with a truss that is satisfactory, he is instructed to wear it day and night for a period of one week; and if it is uncomfortable, or if the hernia is not held completely reduced, adjustments are made as necessary. Occasionally, in patients who have never worn a truss before there is considerable irritation of the skin, and it may be necessary to discontinue wearing it for a few days. Before beginning the treatment, however, every difficulty involved in the fitting and wearing must be adjusted. This may take from one to three weeks, but such time is well spent, as it assures the success of the subsequent treatment. Once the treatment is begun, the truss is never removed, except by the physician for the purpose of treatment.

PROCEDURE IN TREATMENT

The treatment is begun with the patient placed on a surgical table in Trendelenburg position and the truss removed by the physician. It has been found unnecessary to remove the truss entirely, as it can be slipped down over the thighs while the patient aids by slightly lifting the buttocks. With the truss removed and the patient in this position, the hernia is found to be completely reduced. The hair over the inguinal region is clipped and cleansed with alcohol, then painted with iodine solution or tincture of merthiolate, after which the patient is ready for the injection of the proliferating solution. A suitable local anesthetic is given preliminary to the injection of the solution. A local anesthetic of novocain 2 per cent is satisfactory, but a combination of novocain 2 per cent, nupercain 1:1000, and benzyl alcohol 2 per cent in distilled water gives a more prolonged effect. If Syllasol is used, no local anesthetic is necessary, since it is not painful when injected into tissues.

Needles.—The choice of a needle depends on the distance between the skin and the inguinal canal. This varies with individual patients and with the thickness of the abdominal wall. In thin persons, a needle 1 to 1¼ inches is satisfactory, while in more obese patients needles of 1½ to 2½ inches may be required. Generally speaking, the smallest gauge commensurate with the length is the most satisfactory. With the proper-size needle determined, it is fitted to a five cubic centimeter Luer syringe and then filled with the anesthetic.

TECHNIQUE

The syringe is loaded with four cubic centimeters of the local anesthetic, and the injection is given with the operator standing on the left side

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Read before the General Surgery Section of the California Medical Association at the sixty-fifth annual session, Coronado, May 25-28, 1936.

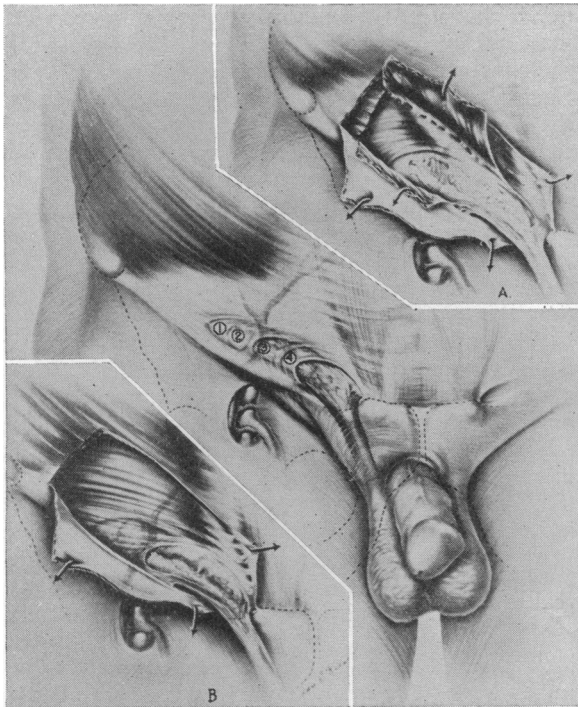


Fig. 1

Fig. 1.—Diagram to show points of injection in indirect inguinal hernia. Note that the first injections are given over the internal ring and subsequent injections placed down the canal. Two to four injections are given at each of the figured points.

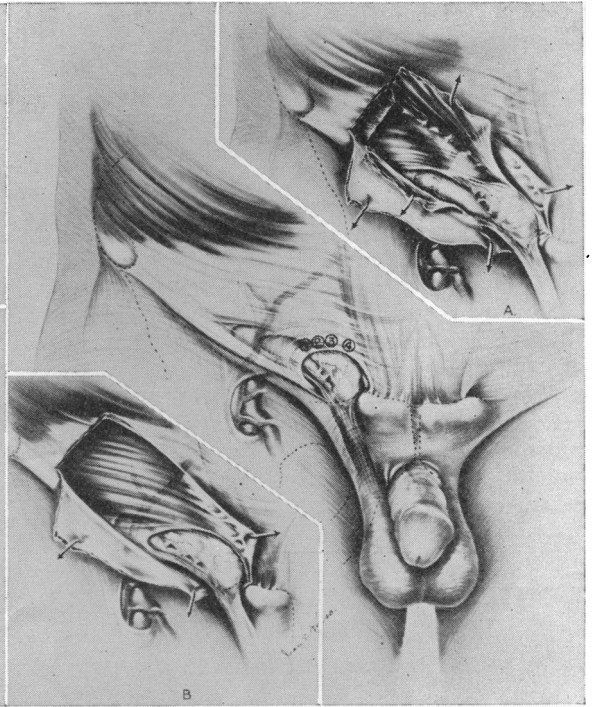


Fig. 2

Fig. 2.—Diagram to show points of injection for a direct inguinal hernia. Note that the injections are given over Hesselbach's triangle. Two to four injections are given at each of the figured points.

of the patient. Regardless of whether the hernia is on the right or left side, this position is most satisfactory for right-handed operators. The index finger of the left hand is then placed into the external ring by invaginating the scrotum. The tip of the invaginating finger can be palpated by the right hand. With the tip of this finger as a guide to the direction of the inguinal canal, the internal ring is located one centimeter above the inguinal ligament, and midway between the anterior superior spine and the pubic spine. The needle with the Luer attached is then inserted through the skin, fat, and through the external oblique muscle. No skin bleb of anesthetic is used, since the injection of the needle through the skin is no more painful than the injection of the bleb. As the needle passes through the external oblique there is a definite "give," similar to the one experienced in passing a needle into the spinal canal. This will be more marked if the needle used has a blunt bevel. The needle within the inguinal canal can often be readily palpated by the index finger of the left hand, which is invaginated through the scrotum into the canal. The plunger of the Luer is then withdrawn slightly to make sure that a blood vessel has not been entered, and if no blood is withdrawn the anesthetic is slowly injected. Following the injection the Luer is removed from the needle, but the needle is left in place. This is done so that the anesthetized area will correspond exactly to the area which will be injected shortly by the proliferating solution. If the needle is removed and a second needle injected with the solution after the anesthetic has taken effect, it is

difficult to get the exact layer of anesthetized tissue. The projecting hub of the needle is then covered with a sterile gauze pad, and the patient cautioned neither to move nor cough.

A ten-minute period is then allowed to elapse in order to give time for the local anesthetic to take effect. The Luer is then filled with three cubic centimeters of the proliferating solution attached to the needle, and the solution is slowly injected. The needle is removed and the patient allowed to remain in the Trendelenburg position for a period of ten minutes, following which the truss is reapplied by the physician, and the patient can get up from the table.

SUBSEQUENT INJECTIONS

Subsequent injections are given every other day, and all except the first injection are of four cubic centimeters of the proliferating solution. In all injections following the initial one, the amount of anesthetic used is five cubic centimeters. In other words, the amount of local anesthetic used should be one cubic centimeter greater than the amount of proliferating solution injected. The dose of Syllasol is three cubic centimeters for each injection.

Subsequent injections are given in the region of the internal ring until that area is filled with plastic exudate; these are usually three to five injections. Further injections are given down the inguinal canal toward the external ring. In the case of a direct hernia the injections are given in the region of Hesselbach's triangle. (Figs. 1 and 2.)

After a few injections it is hard to identify the external ring, and a hard rubber-like mass is felt, occupying the greater part of the inguinal canal. If injections are now continued into this area, it feels as if the needle is being inserted into rubber. After a few injections one sometimes notices, on aspirating following the injection of the preliminary novocain, the return of a yellowish, murky fluid. This should not be mistaken for either bladder contents or peritoneal fluid. It represents the mixture of the anesthetic agent with the edematous exudate in the inguinal canal, and injections may be continued into such a region. Injections are given until the inguinal canal and the region of Hesselbach's triangle are entirely closed.

The number of injections in any given case depend on two factors, the size of the hernia and the seroplastic reaction of the individual. As a general rule, in elderly patients there is less seroplastic reaction, consequently more injections are required. A graphic record is kept of the injections given to each patient.

After the last injection the patient continues to wear the truss day and night for a period of four weeks to allow the newly formed fibroblastic tissue to increase in strength. At this stage of the treatment any descent of the contents of the sac would cause distention of the inguinal canal and a tearing and destruction of the newly formed fibroblastic tissue. Following this four-week period, it is advisable to wear the truss during the day only for an additional period of four to six months.

FOUR PHASES OF TREATMENT

A description of the complete course of treatment divides itself into four phases:

1. The preliminary treatment, consisting of eight to twelve injections as just described, given three times a week, usually closing the hernia.
2. The reinforcing treatment, consisting of one injection a week for four weeks. The location of these injections is determined by the judgment of the operator.
3. Period of immediate follow-up during which the patient is examined once a month for six months, and if there is any evidence of weakness an occasional reinforcing injection is given.
4. Final follow-up period, extending over a period of one year. The patient is seen at intervals of two months for check-up examination.

COMPLICATIONS

Complications during the course of treatment are surprisingly small. Patients not infrequently complain of curious transient subjective sensations, such as burning in the scrotum or penis, on the inner side of the thigh, or a sensation of warmth around the anus. These painful sensations are due to involvement of the ilio-inguinal nerve and its branches. By slight movement of the injecting needle when such sensations appear, this type of pain may be minimized. Occasionally, a few seconds after an injection in the neighborhood of the internal ring there may be a feeling of cramp in the distribution of the anterior crural nerve. Following the first or second injection,

there may be some swelling and induration of the inguinal canal or of the cord, the skin of the scrotum or the epididymis. This may be painful, but it has never kept a patient from his routine duty and quickly responds to local applications of heat. Such complication is due to temporary obstruction of the spermatic circulation from the edematous reaction produced by the solution. However, there has been no case of permanent damage or any atrophy of the testicle. If while giving an injection the needle inadvertently enters a blood vessel, it is withdrawn and no injection is given that day. This has occurred about once in every seventy-five injections in our series. Rarely the needle is injected into the peritoneal cavity, and in our series it has only occurred eight times in about three thousand injections. If the proliferating solution is injected into the peritoneum, the patient complains of extremely severe cramp-like pain which gradually subsides in ten to twenty minutes, depending on the amount of solution injected. No untoward results have been seen clinically, nor have they appeared, as outlined above, experimentally from this accident. In order to minimize these accidents the injection of the proliferating solution should be given *very slowly*, and at the first complaint of colicky pain the injection is discontinued.

CONTRAINDICATIONS AND DANGERS

No case of irreducible, incarcerated, strangulated or sliding hernia or hernia associated with undescended testicle can be considered suitable for treatment by this method. The danger of perforating the bowel in such cases with a production of fecal fistulae and peritonitis is obvious. Even in the reducible herniae the peritoneal cavity may be occasionally entered through an error in technique and, although there is no danger to life by such a mistake, the patient experiences pain sufficient to produce a state of shock. To minimize such a dangerous complication, emphasis cannot be placed too strongly on the necessity of injecting the proliferating solution slowly and cautiously. In this respect the alcoholic solutions of tannic acid appear somewhat safer, as they produce an instantaneous peritoneal reaction which can be minimized by stopping the injection. A non-alcoholic solution such as Syllasol has a latent period of pain production, so that if the peritoneal cavity is entered the full dose will inadvertently be given. The shock resulting from such a procedure will not become apparent for five to ten minutes.

Hemophilia is a contraindication to this procedure as it is for any treatment which requires repeated punctures with a needle. Chronic urinary retention in elderly men increases the danger of bladder injury, and unless one is thoroughly experienced such cases should not be attempted.

It is a general surgical principle that injections of any type should not be given in the face of apparent superficial skin infection, and the indiscriminate use of this method of treatment in patients suffering from any type of infection in the area to be injected must result in disaster. Diabetics are best not treated because of their increased susceptibility to local infection.

TABLE 1.—*Statistical Table Results of Injection of Hernia to May, 1936*

Total Number of Cases: 165	Completed Cases	Patients Under Treatment	Total
Inguinal—Good surgical risks (direct and indirect) (Average age 37)	73	66	139
Inguinal—Poor surgical risks (direct and indirect) (Average age 68)	23	3	26
			165

Cases in which the intelligent coöperation of the patient cannot be absolutely assured are best advised against this treatment. The inconvenience of wearing a truss continuously day and night for a period of six weeks to two months should be thoroughly explained to the patient, and unless a promise of obedience to this rule is obtained there is danger of complete failure of the treatment. A partially completed treatment in such a case may increase the danger of strangulation in that particular hernia. Highly nervous or apprehensive individuals, cases of hyperthyroidism and children are not good subjects in general for any form of local injection treatment, and are better treated by the recognized surgical procedures.

Especially dangerous is the use of solutions which have not been proved by experimental and clinical results to be suitable for the treatment of hernia by injection. The type of solution used in the treatment of varicose veins is absolutely contraindicated, as it works on an entirely different principle.

RESULTS

Since this work was started in the outpatient department of the Mount Zion Hospital early in 1934, one hundred and sixty-five cases of inguinal hernia, both direct and indirect, have been treated. The entire number of injections given has been well over three thousand. Although it is too early to state definitely that the results are equal or even better than those treated by surgery, we can say that at the completion of treatment in all these cases, and in the follow-up period available up to this date (May, 1936), the results from both the patients and the surgeons' standpoint have been eminently satisfactory. Bratrud,² Mayer, and Fowler in this country, Gray in England, and Wyss in Switzerland, have reported many thousands of cases with longer follow-ups, and their results have been very favorable; these authors claim a recurrence of only from 2 to 10 per cent.

For a statistical analysis we have divided our cases into two groups which have been designated as, first, the operative group or that group which would ordinarily be classed as a good operative risk; and, second, a non-operative group, including such patients who, for one reason or another, are poor surgical risks. In the first group our statistics show that the number of recurrences and the ease of cure compares most favorably with

operative statistics, in fact our recurrence rate being about 4 per cent. In the second group the recurrence rate is about 22 per cent. (Tables 1 and 2.)

COMMENT

Recurrences.—Recently W. B. Coley, in the *American Journal of Surgery*, wrote an editorial on hernia and discussed the experience of workers at the Ruptured and Crippled Hospital in New York with the injection method.³ He made the bare statement that "first the results seemed very satisfactory, but by the end of six months there were so many recurrences that the method was definitely abandoned." Such a statement is naturally extremely disquieting, but as no details are furnished regarding the technique of treatment it is impossible to critically analyze or explain his conclusions, in the light of our experience, which we are reporting today.

Our own figures show a recurrence rate at this time of about 4 per cent in a group of patients who would have been excellent risks for a surgical repair. Such a figure certainly is no worse than the expected recurrence rate following operation. We further believe that with greater experience in this method of treatment our recurrence rate in this group will be definitely decreased.⁴

A re-definition of the word "recurrence" must be found, as we apply it to a discussion of cases treated by the injection method. If a weakness appears at the site of the hernia following treatment by the injection method, we can more properly say that this case is one in which there has been insufficient treatment. If such a weakness does occur, a few additional injections will close the hernia. It is not a recurrence in the surgical sense of the word, but rather insufficient treatment. If we find, for example, that those cases which have had six or eight injections show weakness in the course of a few months following treatment, it may be necessary to increase the number of initial injections to ten, twelve, or even fifteen, as a routine procedure. The greater our experience has been, the more convinced we become of the importance of subsequent injections following the apparently complete closure of the hernia. If despite an indefinite number of injections the weakness still persists, these cases are the ones that we can classify as recurrences.

Regarding that group of patients whose average age is sixty-eight and who were suffering in

TABLE 2.—*Recurrences*

(All cases with from 6 to 18 months follow-up after completion of treatment)

	Inguinal Good Surgical Risk	Inguinal Poor Surgical Risk
Number of cases	73	23
Number of recurrences....	3	5
Percentage of recurrences	4.1%	21.7%

many cases from advanced forms of heart disease, chronic bronchitis and general senile debility, and whom we have placed in a group called nonoperative cases, we consider our recurrence rate of 22 per cent very satisfactory. One must remember that 78 per cent of this group were cured of their hernia, while surgery offered none of these patients the possibility of relief. Furthermore, of the 22 per cent we have classified as recurrences every patient has shown some degree of improvement either in marked diminution of the size of the rupture or improvement to the point where a truss could be fitted to satisfactorily maintain the hernia and eliminate the discomforts of a completely uncontrolled rupture.

Mortality.—There is no mortality attributable to the injection method as used today. Reports of mortality appearing in the literature from 1840 to 1910 followed the injection of phenol iodine, etc., and do not in any sense apply to the modern method. The dangers of postoperative pneumonia, embolus, and the other complications following the surgical treatment of hernia are familiar to all of us. It is significant that not once in the modern literature does there appear a record of similar complications following the injection method.

Applicability to Recurrent Hernias.—The method is particularly valuable in cases of recurrent hernia. Such cases are the bane of the surgeon. An operator should welcome a method which offers the possibilities of successfully treating their recurrent herniae without recourse to surgical intervention. The results obtained by the injection treatment in this group of cases have been, in our experience, particularly gratifying.

The treatment is entirely ambulatory. The advantage of the lessened cost, due to elimination of hospitalization and loss of work, is obvious.

SUMMARY AND CONCLUSIONS

1. The injection treatment of hernia is applicable to all cases of reducible inguinal hernia.

2. An exacting technique is described which involves:

(a) The use of proved solutions.

(b) Knowledge on the part of the surgeon of the anatomy of the inguinal region as well as the proper fitting of a truss.

(c) A period of treatment and observation extending over eighteen to twenty months.

3. There have been no untoward complications, no atrophy of the testicle, no impotence, no deaths in a series of 165 cases.

4. A recurrence rate of 4 per cent is reported by this method of treatment when used in young, good risk individuals; and of 22 per cent in a group of elderly, poor risk patients.

5. The method of treatment can be expected to give better results than reported, as more knowledge and greater experience is obtained by surgeons using it.

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DISCUSSION*

CHARLES EATON PHILLIPS, M.D., (1919 Wilshire Boulevard, Los Angeles).—The history of the injection treatment of hernia seems to have originated with George Heaton in the year 1832. Whether he was a physician or a charlatan is not apparent. His claims to a 100 per cent cures might be considered an evidence of irregularity! Before the days of anesthesia his method had much to recommend it.

Since the advent of anesthesia it has been exploited by the quacks who have popularized the treatment with the slogan, "Hernia cured without the knife."

The fact that a simple obliteration of the sac by any means is said to cure from 70 to 80 per cent of hernias renders "experience fallacious and judgment difficult."

Hernia operations consisted of little more than a resection of the sac up to the time of Bassini who, in 1885 (published in 1888), showed that the most important consideration in the cure of hernia was in the restoration of the musculature over the defect. Hernias which healed by the formation of scar tissue were liable to recurrences in 20 to 30 per cent of cases, while restoration of the musculature of the canal resulted in a cure in 95 to 98 per cent of cases.

Anyone who has had extensive experience in the closure of abdominal wounds knows that the presence of scar tissue jeopardizes the result. The utilization of scar tissue in the closure of a defect invites almost certain subsequent rupture. While the recurrence may be delayed until there is a natural atrophy affecting the scar tissue, the certainty of recurrence varies with the amount of scar in its closure. The injection treatment claims to cure the hernia by scar formation.

Safety.—No one has the diagnostic acumen to tell accurately what is contained in the hernial sac. A small diverticulum of the bladder or adherent intestine or appendix at the internal ring cannot be determined by the most careful physical examination. A solution which is innocuous when injected into the peritoneal cavity or into a vein may cause necrosis of the bowel when injected into its wall. The same can happen when the injection is inadvertently made into a bladder diverticulum. The probability of injury to the vas and sterilization by injection should not be overlooked.

These are not theories. They are things actually happening following the injection treatment of hernias. The writer has been informed, on good authority, that three fatal cases have been admitted to one hospital within the past few weeks. The injections penetrated the wall of an adherent cecum with subsequent perforation, peritonitis and death.

If the treatment is actuated by the effort to save someone money, why not save the cost of the injection and let the patient continue to wear his truss?

The conclusions of such an authority as W. B. Coley and associates in the Ruptured and Crippled Hospital in New York, who have tried the method and have abandoned it, should not be taken lightly.

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FRANCIS M. FINDLAY, M.D. (1515 State Street, Santa Barbara).—The papers of Doctors Girard, Harris, and White should be studied by every physician who contemplates using the injection method for treatment of hernia. The historical background and experimental evidence that support this form of therapy have been admirably summarized by them. These men have given us their clinical results in a frank, impartial manner. We are, therefore, indebted to them and to their colleagues, who are working

* A discussion on papers of Dr. F. R. Girard, page 385, and Drs. F. I. Harris and A. S. White, pages 382 and 391.

in other medical schools and clinics, for the scientific, orderly presentation of a problem formerly handled by the charlatans and quacks.

I am especially glad that the papers presented today have stressed the necessity for careful observation of clinical results and a further study of the problem. Reporting of bad as well as good results is essential if we are properly to evaluate any method of treatment. Only by combined efforts along these lines will we ascertain the truth. Success in this field demands a sound surgical training and complete knowledge of the anatomy of the inguinal region.

The injection treatment for hernia is now very popular with many doctors in this country, especially in California. Even the most skeptical must admit that, in the majority of cases, firm scar tissue forms and closes the hernia. There is, however, considerable, justifiable doubt in the minds of many sane, experienced surgeons as to the permanency of these results. Such observers rightly question that the fibrous tissue resulting from these proliferative solutions is the equivalent of living fascial grafts in the repair of a weakened abdominal wall. Time alone will tell whether the injection form of treatment will constantly give permanent results and eventually replace operation in the majority of cases.

The speakers have stressed some of the definite dangers inherent in this form of therapy. I wish to reemphasize that this procedure is not free of risk, and to add a warning concerning the possibility of gas-gangrene infection in these cases.

In their enthusiasm for this nonoperative treatment some men fail to realize that there are definite inherent dangers in the procedure. The injection treatment of hernia is still somewhat of a blind procedure, for it is impossible to visualize the hernial sac and its contents, or to determine accurately its extent. Although the hernia may apparently be reduced, there is always a distinct possibility of a piece of omentum or intestine being caught in the inguinal canal, or adherent at the internal inguinal ring. An adherent loop of bowel can easily be punctured by the injecting needle and infection result.

I add this warning concerning the dangers of injection because of the recent occurrence of a fatal case of gas-bacillus infection which followed the injection treatment of hernia. This patient, a 75-year-old diabetic, had been treated in another city by a physician with considerable experience in the injection method, and he was given four routine injections of four cubic centimeters each of Pina Mestre solution at three-day intervals, without incident. But three days after the last injection the patient became ill and his diabetes grew worse. He did not improve at home, so two weeks after the last injection he entered the hospital. On admission he complained of pain in his groin and lower abdomen, with stiffness of his thigh muscles. Motion of the hip was painful, and the patient continued to run a septic temperature, at times being irrational. Although no localizing signs of pus could be found around the hip on admission, the thigh was swollen. On the twelfth day the patient's temperature rose to 104 degrees, and a distinct crepitation in the tissues around the hip was first observed. That afternoon the patient went into collapse, from which he failed to recover, dying on the fourteenth day.

Autopsy disclosed extensive gangrene of the right iliopsoas muscle, extending down into the thigh, apparently originating at the internal inguinal ring. The tissue had the characteristic appearance and odor of gas-bacillus infection. The anaerobic *Bacillus welchii* was recovered from the muscle tissue and identified both by smear and culture, removing all doubt as to the causative agent. Further examination disclosed a loop of small intestine adherent to the inguinal ring that apparently had been punctured by the injecting needle, causing leakage of intestinal content with the fatal gas-producing organisms.

Every physician should know that puncture of the bowel may occur during the injection treatment of hernia. If leakage of intestinal content occurs, a virulent anaerobic infection that is usually fatal may result. Although these papers today have shown that the injection treatment of hernia is now being studied in a scientific manner, we must remember that this form of therapy is not entirely free of risk.

LEONARD DOBSON, M. D. (Stanford Hospital, San Francisco).—At first I was prejudiced against the injection treatment of hernia. Before I was familiar with the technique I felt it was a blind procedure, frequently accompanied by serious complications and productive of doubtful end-results. As Doctors Girard, Harris, and White have shown in their papers, that opinion was fully justified until several years ago, when carefully conducted experimental work produced safe, effective solutions and a satisfactory technique. Before adopting a new procedure the medical profession wants to know the end-results, and carefully controlled follow-up series have only recently been reported.

I became interested in this treatment by observing in Doctor Girard's hernia clinic. I desired to determine the effects in the tissues of the various solutions used, so before starting to use the treatment, I conducted a series of animal experiments in the Stanford surgical laboratory. The rectus muscles of dogs were injected with three of the most commonly used solutions (phenol and thuja mixture, proliferal, and sylasol). Tissue was removed from the injected areas at various intervals from one to one hundred and twenty days and examined microscopically. The reaction of the tissues to the various solutions was very similar and paralleled the results obtained by Doctors Harris and White in guinea pigs, except that the early polymorphonuclear response was not as intense.

Since starting the injection treatment in the Stanford surgical clinic nine months ago, we have had no complications. Sylasol has been the solution used. The cases have been under observation too short a time to report end-results, but no recurrences have been noted to date. We have used the treatment in both direct and indirect inguinal hernias.

I agree that this method of treatment should only be employed by surgeons thoroughly familiar with the anatomy of the inguinal and femoral regions, and feel that the best results will be obtained by those who have injected a large number of cases. I feel that the method will not supplant surgery in the treatment of hernia, but is a highly successful adjunct in selected cases.

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E. ERIC LARSON, M. D. (1930 Wilshire Boulevard, Los Angeles).—Surgical repair of herniae has been improved to such an extent that most any well-qualified surgeon can offer to his patient an excellent prospect of cure. It is difficult to counteract this with new ideas and methods.

Since compensation insurance is universal, and herniae are general among humans, it is quite logical that both the insurance carriers and the layman are willing to try a new method for cure when time and finances may be of prime importance.

In spite of conflicting reports over a large series of cases, the more recent injection method must be thoroughly investigated and the results tabulated over a long period of time.

The authors of these papers have made a distinct contribution to the literature on the subject. The animal experimentation toward the cellular pathology caused by the different solutions is noteworthy. Their tabulated series of patients so treated are interesting, and certainly merit close study and comparison with the surgical repair.

The safeguards mentioned by the authors are made for the best interest of the patients and the method of treatment, and should be carefully considered. The subject is still quite controversial and complications can end in disaster for the patient.

Careful selection of coöperative patients to those with reducible herniae, securely held by a spring truss and treated by well-qualified surgeons who know the anatomy and complications that can easily occur, is stressed by the authors.

Certainly poor risks for surgical repair such as the aged and those with chronic ailments, such as diabetes and tuberculosis, and even those patients with an enlarged ring conducive to a potential hernia, should have the advantage of the injection treatment. Recurrences of minor proportions can also be treated with efficiency by injections.

I have had the opportunity of examining many such individuals with excellent results after this treatment. Attention has recently been called to the danger of truss pressure to the cord when there is a scar tissue surround-

ing this structure. Refinements in technique and elaboration of the best solution to be used, as well as after-care, have not been fully worked out. Such papers as these will add a great deal in perfecting the scarifying method for treating reducible hernia. I am sure nearly all of us agree it has already established a place in our method of treating herniae.

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ALANSON WEEKS, M.D., AND G. D. DELPRAT, M.D. (384 Post Street, San Francisco).—Doctor Girard, and Doctors Harris and White present a very careful and clear discussion of the subject, "Treatment of Hernia by the Injection Method," and it is perhaps presumptuous for those who have not used this method of treatment to discuss their papers.

The authors describe the fluids used for injection and state that their action is due to the production of an exudate and later fibrous tissue development between the layers of the muscles of the inguinal canal. The rationale of the treatment is based upon the fact that after an inguinal hernia is reduced, pressure on the inguinal canal will prevent the contents of the hernia sac passing down the canal. If, instead of the pressure being exerted from the outside, the two layers of the inguinal canal are made to adhere to one another by fibrous tissue, the same result will be achieved. Therefore, this treatment is applicable to those patients who have indirect inguinal hernias which are completely reducible. This treatment does not apply to persons having incisional hernias or irreducible hernias, and it would also appear to us that it would not apply to direct inguinal hernias, although it has been used for such. The value of this treatment lies particularly in that group of patients who, because of various systemic conditions, are unable to undergo surgical procedure; and it is also advised in others for economic reasons.

The authors also draw attention to the fact that this type of treatment may fall into disrepute because it may be undertaken by individuals who have very little knowledge of the anatomy of the inguinal region who might be tempted to use the injection treatment, whereas they would not trust themselves to undertake a surgical cure of the condition.

In regard to the matter of healing of hernias, it has been always our teaching that one could rely very little upon the tensile strength of scar tissue in that if one relied upon scar tissue to hold a hernia, he would almost always encounter a recurrence, and in fact one of the common causes of repeated recurrences in the same individual lay in the fact that scar tissue was used for closure and the scar tissue gradually gave way. On the other hand, the actual suturing of fascia to fascia reduced to a minimum the area of scar tissue formation, and therefore the fascia itself is called upon to support the hernia. One of the causes of recurrence is the difficulty in bringing fascia to fascia, obtaining instead merely fascia to scar tissue. Therefore, in performing an inguinal hernioplasty, if one were unable to obtain fascia on the edge of the conjoined tendon (either owing to the fact that the fascia was poorly developed or that the muscle belly was so well developed that the fascia was out of reach, being some distance from the inguinal ligament), it was desirable to follow the method shown us by Dr. T. M. Joyce of Portland, who obtains a long strip of fascia from the edge of the external oblique and uses this to suture the external oblique down to the shelving edge of the inguinal ligament. This method in his hands, he states, has given him excellent results without recurrence in the last five years. This is an improved modification of the original McArthur's autoplasmic suture in the radical cure of hernia in that the main value of the operation is the suturing of the cut edge of the external oblique with a live suture, under the cord to the shelving portion of the inguinal ligament, and then the suturing of the extra outer part of the fascia of the external oblique over the cord can be done with catgut or silk, that part being apparently unimportant. The main modification of the operation is that no suturing is done through muscle fibers, which will always cause scarring and destruction of the normal activity of the muscle.

It appears to us at the present time that such a method of treatment is preferable, particularly in view of the fact that it is well known that an indirect hernia cannot be

always distinguished clinically from a direct hernia, because if the external ring is reasonably small one is not always sure whether the hernia sac comes down to the canal from the internal ring or from Hesselbach's triangle, and the one would be amenable to the injection method and the other probably not.

We believe that the operative treatment of inguinal hernia is so simple nowadays under local anesthesia, and so certain of a good result with the use of the strip of live fascia for suture material, that the use of any blind method, such as injection, is not in keeping with good practice.

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DONALD C. COLLINS, M.D. (1930 Wilshire Boulevard, Los Angeles).—The contributions of Doctor Girard and of Doctors Harris and White upon the injection treatment of hernia are both timely and noteworthy. They are to be congratulated upon presenting us excellently prepared studies of one of the most highly controversial subjects of the present moment in medicine. I do not wish to detract one iota from the credit that is justly due these authors, but several facts merit serious consideration in the proper evaluation of this problem.

The large American clinics and hospitals in the East and Middle-West, where this form of therapy was so enthusiastically begun on a large scale, some six years ago, have now found that the percentage of recurrences has been considerably increased over that experienced following surgical repairs. Thus, they have either markedly limited the indications for this mode of treatment or have decided that it should be discontinued. The complications that may follow injections cannot be lightly brushed aside as of no consequence. In my own limited personal experience during this past year, I have observed two fatal pulmonary embolisms, a secondary gangrene of the sigmoid and upper rectum, and two complete bowel obstructions resulting from the accidental escape of some of the injecting fluid into the peritoneal cavity.

Other objectionable factors in the injection method of therapy include the constant wearing of a "truss" day and night for a period varying from three to nine months following treatments. This is contrary to all surgical conceptions of optimum conditions for proper healing. The injection method does not guarantee that patients may again resume heavy work unless they have the additional protection of a "truss." The total amount of money expended by the private patient is about the same whether he is operated upon or injected. The only difference lies in the fact that the physician who performs the injections gets all the money instead of dividing it with the hospital.

During the past few years the conviction has steadily gained ground that, surgically, hernias should utilize, if possible, the patient's own fascia for suture material by either the McArthur or the Gallie-J. C. Masson method. Many of the failures in the past following hernioplasties were directly attributable to the use of improperly chosen foreign suture materials. Autogenous fascia does not slough out nor does such a hernial repair break down in the presence of infection. This generation of physicians has largely forgotten the bitterly learned truths of the Bassini era concerning the necessity of removing the hernial sac and transplanting the inguinal vas and its structures superficially under direct vision so as to insure a permanent cure.

Any injection method is of necessity an admittedly blind procedure. Injury to the ilioinguinal and iliohypogastric nerves is a serious complication which may lead to a diffuse weakness of the entire lower abdominal wall on that side, as we have observed to occur occasionally in a carelessly performed McBurney incision. Hematoma, thrombophlebitis, or injury to the contents of an irreducible hernial sac may lead to grave consequences. The sweeping and unproved contentions that this method of therapy can be safely used in all varieties of herniation is without foundation, and will not stand before the impartial scrutiny of established scientific facts. Any investigator, claiming to have healed a hernia permanently, must submit as evidence at least a five-year follow-up study. Injection therapy cannot be safely entrusted to the general practitioner who only occasionally treats a hernia. Thus, this method can only be safely employed by those who are doing this method of therapy daily. It is my belief that

injections may be tried in those individuals cautiously in whom surgery is contraindicated either because of advanced age or due to grave organic disease.

These are some of the reasons why I firmly believe that the injection method of treating hernias is one of only temporary and fashionable interest. I predict that the use of autogenous fascial sutures will probably prove to be the ultimate solution to the entire hernial problem, and will give such a high percentage of permanent cures that many of our present concepts will be discarded as worthless.

Again, I wish to compliment both Doctor Girard and Doctors Harris and White on presenting such excellent and timely studies upon this important question. They have performed valuable pioneer work in an attempt to better our present hernioplasty results. Through efforts such as theirs the field of medicine is advanced and its scope of usefulness is widened; so that in the end men may live happier and more useful lives.



W. L. WEBER, M. D. (Pacific Electric Building, Los Angeles).—I had the pleasure of hearing the writers at the California state meeting at Coronado in May, 1936. It was Doctor Girard who, although perhaps altogether unknown to him, first stimulated my interest in taking up the injection treatment of hernia. As a matter of fact, before the meeting of the American College of Surgeons held in San Francisco in October, 1935, I was definitely critical of and prejudiced against the treatment without, however, having had any personal experience with the method. I had observed a number of patients who had been injected, and the results, to say the least, were not encouraging. I even felt so strongly against the method that I wrote to a certain company giving as my opinion that if they should continue to refer their men for this treatment some serious untoward results would almost certainly occur, and they might be liable for damages because of their having referred the patients for the treatment.

On my way to San Francisco in October, 1935, in discussing the injection treatment with a number of other doctors, I expressed my opinion that the method, so far as I could judge, was unscientific, and certainly not based on sound surgical principles. However, after watching Doctor Girard inject a number of patients, and after having seen some of the patients whom he had injected a year or so before, I came away convinced that the method, in the proper hands and with the proper technique, was certainly entitled to a decent trial before condemnation. Some time after the San Francisco meeting I had the great pleasure of seeing Doctor Bratrud in Los Angeles, and he was good enough to visit our clinic and tell and show us much. The studies of Doctors Rice and Bratrud and others have demonstrated, in my opinion, that the method in the properly selected case has a distinct place in our treatment of hernia.

Statistics the world over suggest that the operative treatment of inguinal hernias is not all that is to be desired, and the fact that there have been so many methods evolved for the radical operative cure of hernia also suggests that operative treatment is not the last word. I need but refer to the article that appeared in *Surgery, Gynecology, and Obstetrics* of April, 1934, by Andrews and Bissell, in which they quote statistics from various authors who give a percentage of recurrences after operation varying from 8 to 32 per cent, and these results by men of standing. This article refers to the direct type of hernia, and I am certain that the percentage of recurrences of the indirect type is not far behind. These colleagues say that the statistics furnished by various operators in the direct type of hernia show, "The results are so bad as to constitute a major surgical scandal."

My experience, over a term of some twenty-three years, has convinced me, at least in so far as my own results are concerned, that the failures after operation and the appalling economic loss involved in all cases, whether the results are good or bad, clearly prove that operation for radical cure of hernia in every case is not warranted in the light of present knowledge of the injection treatment.

My personal experience with the injection method dates only from November, 1935, but since that time I have personally injected some thirty-six patients, and in every

case there has been a decided improvement, and in the majority an apparent cure. In some of the very large hernias the results have been so remarkable that it seems almost incredible that injection of any solution could produce such an effect. In my small series of cases there have been no infections, no sloughing, no hydrocele of the tunica, no testicular atrophy, and in only one case has there been an untoward result, and that in a private patient, an extremely thin person suffering from bilateral hernia, in whom upon the first injection I must have struck the anterior crural nerve, because the patient was not able to stand upon his right leg, and for a number of days he complained of weakness in the leg. This patient has entirely recovered except that the right patellar reflex is still lost. The sensory disturbance in the anterior aspect of the thigh has recovered.

The properly selected case, in my opinion, is one in which the hernia is of direct or indirect inguinal type, easily reducible, and capable of continued reduction by a properly fitted, comfortable truss. I do not believe, at least at this time, that femoral and umbilical hernias are safe or proper types for injection. An important phase of the injection treatment of hernia is the tendency on the part of the operator to charge so much an injection. This, I believe, is wrong, because in the hands of unscrupulous or mercenary persons the number of injections can be augmented *ad libitum*. Furthermore, this method of treatment in any given case is much more troublesome and difficult than is the operative technique, and in my opinion it should be placed on the same financial basis, and like the operative treatment, it should not be undertaken by anyone who is not thoroughly competent to deal with hernia surgically.

The authors are to be congratulated upon the splendid presentation they have made, and I am certain that their writing will do much to stimulate others; at least, to consider the injection method and to regard it as an acceptable treatment in properly selected cases.



DOCTORS HARRIS, WHITE AND GIRARD (Closing).—The authors have repeatedly reiterated in their papers the necessity of confining this method of treatment to men properly trained not only in the technique of hernia injection, but also to those trained especially in surgical diagnosis and operative treatment of the inguino-abdominal region. The fact that this stand is maintained and emphasized by the discussers is appreciated. Too strong emphasis cannot be placed on the limitation of this method of treatment to men especially qualified in its use. It is realized that much harm and serious complication may result from injudicious employment of this method by men in general practice. The selection of cases and the indications for treatment must of necessity be made only by those qualified and trained in the details of its technique.

It is likewise true that all surgical operations may result in disaster when performed by incompetent and untrained operators. The necessity of limiting the use of any surgical procedure to trained men is obvious. Complications which occur in untrained hands must be blamed on the operator and not on the method of treatment. In a consideration of the injection treatment of hernia emphasis must be placed on the thousands of satisfactory results, without complications, recorded by men of unquestioned integrity and not on scattered reports and hearsay evidence on the complications experienced by men untrained in this procedure.

It is significant that in the 350 cases reported in these papers, no serious complications have occurred. Absence of serious complications in these cases is due both to careful selection of patients and to the proper conduct of the treatment. Improper selection of cases and improper conduct of the technique discredits not the treatment but its method of application.

It must be further reiterated that the injection treatment of hernia is not advocated as a substitute for surgical treatment, but is to be used as an adjunct in the treatment of certain selected cases. It is our purpose to demonstrate the feasibility and practicability of this method and to subsequently definitely determine the type of case in which it will have its greatest use.